

# Myotis auriculus. By Richard M. Warner

Published 23 November 1982 by The American Society of Mammalogists

## *Myotis auriculus* Baker and Stains, 1955

### Southwestern Myotis

*Myotis evotis auriculus* Baker and Stains, 1955:83. Type locality 10 mi W and 2 mi S Piedra, 1,200 ft, Sierra de Tamaulipas, Tamaulipas, Mexico.

*Myotis auriculus*, Genoways and Jones, 1969:8. First use of current name combination.

**CONTEXT AND CONTENT.** Order Chiroptera, Suborder Microchiroptera, Family Vespertilionidae, Subfamily Vespertilioninae, Genus *Myotis*, and Subgenus *Myotis*. Findley (1972) placed *M. auriculus* in the *evotis* species group which also includes *M. evotis*, *M. keenii*, and *M. septentrionalis* (see Van Zyll de Jong, 1979). Two subspecies are currently recognized.

*M. a. auriculus* Baker and Stains, 1955:83, see above.

*M. a. apache* Hoffmeister and Krutzsch, 1955:1. Type locality Snow Flat, 8,750 ft, Graham Mountains, Graham County, Arizona.

**DIAGNOSIS.** *Myotis auriculus* is a medium-sized member of the genus with long, brownish ears (Fig. 1). The length of the ears (>17 mm) separates this species from all other North American species of *Myotis* except *M. thysanodes*, *M. milleri*, and other members of the *evotis* species group (see CONTEXT AND CONTENT). *M. septentrionalis* and *M. keenii* are both smaller than *M. auriculus*. The former two species usually have a forearm length less than 36 mm, ears less than 19 mm, and greatest length of skull less than 15.6 mm. These same three measurements for *M. auriculus* are generally greater than 37, 19, and 15.7 mm, respectively. Additionally, neither *M. keenii* nor *M. septentrionalis* occur within the range of *M. auriculus* (compare Fig. 2 to Fig. 2 in Fitch and Shump, 1979). From *M. milleri* this species also differs in size, *M. auriculus* being larger for all skull and external measurements other than ear height. For example, in *M. milleri* forearm length is usually less than 37 mm and greatest length of skull is less than 15.5 mm, which can be compared with the values for *M. auriculus* given above. Qualitatively, *M. auriculus* differs from *M. milleri* in having a more inflated skull, in possessing a distinct sagittal crest (absent in *M. milleri*), and in lacking a distinct microscopic fringe of hairs on the posterior margin of the uropatagium (present in *M. milleri*). *M. auriculus* can be distinguished from *M. thysanodes* by the lack of a distinct macroscopic fringe of hairs on the posterior margin of the uropatagium. The following can be used to distinguish *M. auriculus* from *M. evotis*: lack of a distinct microscopic fringe of hairs on the free border of the uropatagium; brownish rather than blackish ears; ears shorter, usually less than 21 mm from the notch as opposed to normally greater than 21 mm in *M. evotis*; flight membranes lighter colored; dorsal hairs brown basally rather than black; more inflated frontal region of the skull; median postpalatal process long, broad, and rounded (see Fig. 3) not short and pointed; relatively longer dentary, usually more than 82.5% of the condylobasal length. The above is mainly after Findley (1960) and Genoways and Jones (1969).

**GENERAL CHARACTERS.** Averages and extremes of measurements (in mm) for five female *M. a. auriculus* are: total length, 93.2 (86 to 97); tail length, 42.0 (39 to 45); length of hind-foot, 9.3 (8 to 10); length of ear from notch, 19.6 (18 to 20); forearm length, 38.5 (37.3 to 40.2); greatest length of skull, 16.1 (15.8 to 16.4); condylobasal length, 15.4 (15.0 to 15.6); length of maxillary tooththrow, 6.6 (6.5 to 6.7) (Baker and Stains, 1955). Averages of the same measurements for four *M. a. apache* (sex not specified) are: 94; 46; 10.5; 19.4; 38.5; 15.8; 15.1; 6.4 (Hoffmeister and Krutzsch, 1955). Means, plus or minus the standard errors of the means, of four mensural characters from samples of 30 adult female and 30 adult male, respectively, *M. a. apache* are: head and body length,  $53.4 \pm 0.58$ ,  $52.7 \pm 0.47$ ; forearm length,  $37.20 \pm 0.191$ ,  $36.77 \pm 0.206$ ; condylocanine length,  $14.30 \pm$

$0.045$ ,  $14.19 \pm 0.040$ ; and length of the maxillary tooththrow,  $6.42 \pm 0.021$ ,  $6.36 \pm 0.022$  (Williams and Findley, 1979). Williams and Findley found no evidence of sexual dimorphism in size in this species. Additional measurements can be found in Baker and Stains (1955) and Genoways and Jones (1969).

Dorsal coloration is a dull brown with the hairs possessing a darker basal band. The ventral pelage is buffy. The flight membranes are brown and there is no obvious or microscopic fringe of hairs on the posterior margin of the interfemoral membrane. The long, brownish ears (Fig. 1) are particularly distinctive. The nominate subspecies is darker overall than *M. a. apache*.

The skull is characterized by its relatively large size, the inflated frontal region, and the long, rounded median postpalatal process (Fig. 3). Photographs of the skull, as well as photographs of living specimens, were published in Barbour and Davis (1969). Illustrations of the skull, upper molariform teeth, and a baculum were presented in Genoways and Jones (1969).

**DISTRIBUTION.** *Myotis auriculus* is a bat of the southwestern United States and northern Mexico (Fig. 2). The nominate subspecies has been reported from the Mexican states of Nuevo Leon, Tamaulipas, and Veracruz. *M. a. apache* is more widely distributed, occurring from north-central Arizona and north-central New Mexico south to the Mexican state of Jalisco.

Distributions of the subspecies are shown in Fig. 2. Records of occurrence are available in Easterla and Baccus (1973), Findley et al. (1975), Gardner (1965), Jones et al. (1970), Matson and Patten (1975), and Warner and Czaplewski (1981). Altitudinal range is from 366 m to at least 2,226 m. Ecological range is from desert scrub to pine-fir forest and may vary seasonally (Hoffmeister, 1970).

**FORM AND FUNCTION.** The baculum of *M. auriculus* is saddle-shaped with a large distal knob (Fig. 4). Genoways and Jones (1969) found the baculum of *M. auriculus* to be smaller and less complex than those of *M. evotis* and *M. keenii septentrionalis* (= *M. septentrionalis*). Individual variation in bacular size and fine structural detail are to be expected (Genoways and Jones, 1969; Krutzsch and Vaughan, 1955).

Allen (1895) pointed out the occurrence of aberrant tragi in an individual collected in Arizona. He suggested that the abnormally small and blunt tragi were the result of an injury. Koopman (1963) suggested that injury was an unlikely cause as both tragi were similarly deformed.

The urine-concentrating ability of *M. auriculus* is average relative to other insectivorous bats (Geluso, 1978, 1980). The urine osmolality of eight *M. auriculus* tested under water-denied conditions ranged from 2,300 to 3,700 mosmol/kg with a mean of  $2,950 \pm 66$  mosmol/kg. The urine concentrating ability of this species relative to other insectivorous bats is reflected in the



FIGURE 1. Adult male *Myotis auriculus* from Arizona.

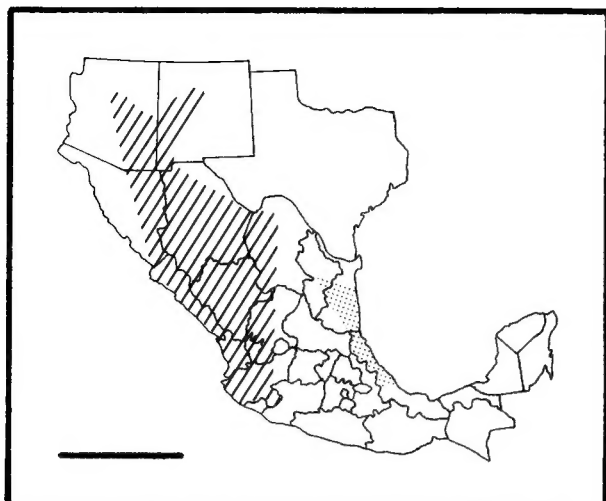


FIGURE 2. Distribution of *M. a. auriculus* (stippling) and *M. a. apache* (oblique hatching). Scale represents 1,000 km.

comparative development of the renal medulla as measured by a number of indices (Geluso, 1978, 1980). Geluso suggested that the relative urine concentrating abilities and correlated renal morphology of *M. auriculus* were reflections of the mesic environments it inhabits.

**ONTOGENY AND REPRODUCTION.** A single young is usually born in June or early July. Barbour and Davis (1969) stated, with little supportive evidence, that parturition apparently occurs later in areas south of Arizona. This is undoubtedly an oversimplification. The timing of parturition is probably affected by climatic factors and can be expected to show considerable spatial and temporal variability.

*Myotis auriculus* is known to live a minimum of 3 years, 2 months based on the recapture of banded individuals (Cockrum, 1973).

**ECOLOGY AND BEHAVIOR.** In Arizona and New Mexico *M. auriculus* is primarily found in ponderosa pine (*Pinus ponderosa*) forests (Findley et al., 1975; Jones, 1965; Warner and Czaplewski, 1981). Barbour and Davis (1969) considered this species to be an inhabitant of "arid woodlands and desert scrub." Seasonal migrations may result in this species selecting different habitats during different seasons (see Hoffmeister, 1970).

Jones (1965) found this species to be active primarily from 1.5 to 2.0 h after sunset and at temperatures of 11° to 19°C. A trimodal activity pattern was presented in Cockrum and Cross (1964) with a major period of activity between 30 and 89 min after sunset and minor periods from 120 to 149 and 180 to 209 min after sunset. Seasonally, Jones (1965) captured this species from April to early September in New Mexico.

Black (1974) and Husar (1976) found that *M. auriculus* ate mostly moths. Males ate significantly more moths than females (Husar, 1976). Fenton and Bell (1979) observed southwestern myotis gleaning insects, primarily moths with 30 to 40 mm wingspans, from buildings and tree trunks. They observed that the bat would land briefly on the substrate while picking the insect off of the surface. A gleaner foraging strategy was previously predicted for this species on the basis of morphological evidence (Findley, 1972) and brain volume relative to body weight (Eisenberg and Wilson, 1978).

Sonagrams and descriptions of echolocation calls were published in Fenton and Bell (1979). The FM signal, with a peculiar initial upswEEP, has most of the energy at 60 kHz. The call is short and of low intensity in comparison with those of congeners studied. While engaged in gleaning behavior no distinct feeding buzz is produced, the repetition rate remaining essentially constant during approach and capture phases.

The mean estimated flight speed of four *M. auriculus* traversing a 30.8 m course was 12.9 km/h (Hayward and Davis, 1964).

**GENETICS.** Both standard (Baker and Jordan, 1970; Baker and Patton, 1967) and G-banded (Bickham, 1979) karyotypes of *M. auriculus* have been described. The following description fol-

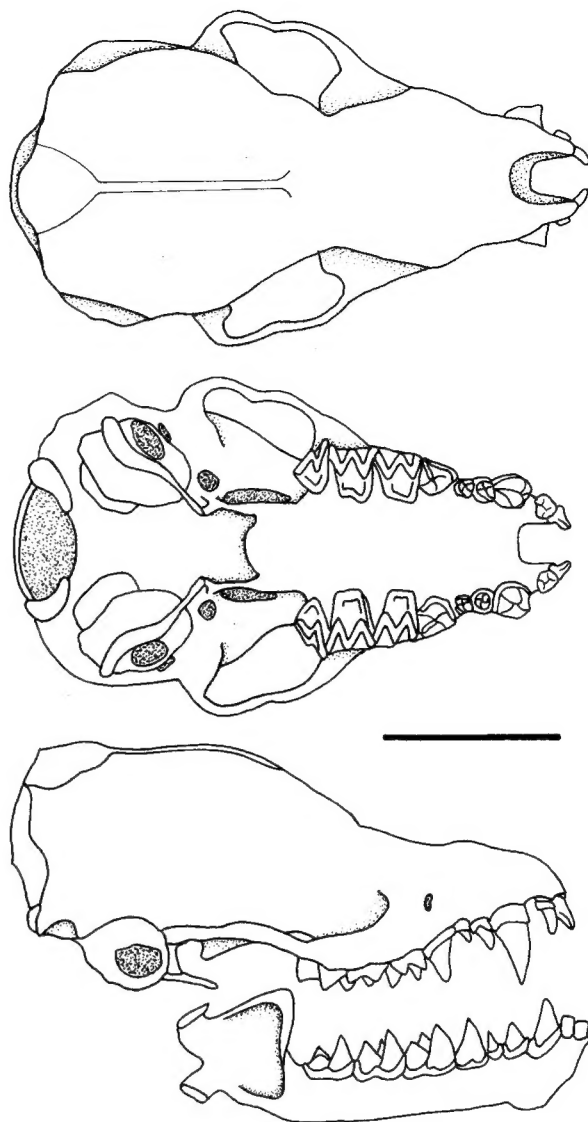


FIGURE 3. Dorsal, ventral, and lateral views of cranium and lateral view of mandible of an adult male *M. a. apache* (NAU 3941). Scale represents 5 mm.

lows Bickham's terminology. The diploid number is 44, in common with all members of the genus studied thus far, but the number of autosomal arms (FN) is 52, not 50 as found in most species of *Myotis*. The higher fundamental number is due to chromosome 25 being biarmed rather than acrocentric, as is usually found in members of this genus. The Y chromosome is larger than that found in most *Myotis* species; it is nearly the size of chromosome 23 rather than approximately the size of the smallest chromosome (number 25), as is commonly found in this genus.

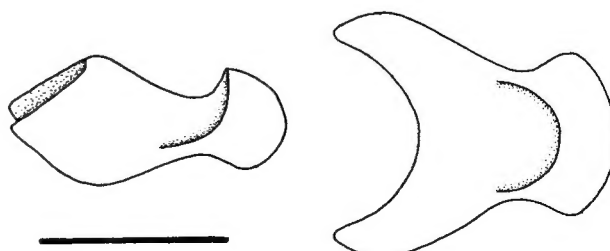


FIGURE 4. Lateral (left) and dorsal (right) views of baculum of *M. a. apache* (NAU 3941). Scale represents 0.5 mm.

Bickham (1979) considered the additional arm and the larger Y chromosome in *M. auriculus* to be derived characters.

**REMARKS.** *Myotis auriculus* and *M. evotis* are apparently parapatrically distributed with a narrow zone of overlap in Arizona and New Mexico. Allen (1897) may have been the first to discern that the southern form of long-eared *Myotis* (*auriculus*) differed from the northern form (*evotis*). In his monograph he included, in Plate II, diagrams of the uropatagium of both forms. The northern example (from Wyoming) had a distinct microscopic fringe of hairs on the posterior margin; this fringe was lacking on the illustration of the southern form (from Veracruz). *M. auriculus* has had a rather complex taxonomic history, which was reviewed by Genoways and Jones (1969).

The generic name, *Myotis*, means mouse-eared. The specific epithet refers to the long external ear pinnae of this species. The subspecific name *apache* refers to the Apachian biotic province in which this subspecies occurs.

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